OCIO Program

Distributed Visualization

Completed Technology Project (2009 - 2015)

Project Introduction

Distributed Visualization allows anyone, anywhere, to see any simulation, at any time. Development focuses on algorithms, software, data formats, data systems and processes to enable sharing simulation-based information across temporal and spatial boundaries without requiring stakeholders to possess highly-specialized and very expensive display systems. It also introduces abstraction between the native and shared data. This allows teams to share results without giving away proprietary or sensitive data. The initial implementation of this capability is the Distributed Observer Network (DON) version 3.1. DON 3.1 is available for public release in the NASA Software Store (https://software.nasa.gov/software/KSC-13775) and works with version 3.0 of the Model Process Control specification (an XML Simulation Data Representation and Communication Language) to display complex graphical information and associated Meta-Data.

As NASA's teams grow increasingly diverse and even more dispersed, new means of sharing data and experiences among team members are required. Collaboration must occur across teams in different geographic locations, different time zones and, in the case of missions on the distant horizon, different generations. Each team brings a different gift to the table. They have different expertise and use different tools to meet their goals, yet they must all somehow come together to achieve a single vision. Distributed Visualization strives to unify teams and technologies by providing a common mechanism for sharing and integrating pertinent data. To accomplish this task, algorithms, software, data formats, data systems, and process are examined to identify and implement those which will best enable the sharing and integration of simulation-based information across temporal and spatial boundaries. To date, demonstrated work in Distributed Visualization has dealt with physics-based simulations and utilized a variety of graphics engines and toolkits. In addition to the application of these technologies, significant effort has been expended to define data elements, identify process commonality among simulation teams, establish interfaces, and evolve data standards. The result of the data standard work has been collected and published as the Model Process Control (MPC) Interface and documented for public use. This approach has resulted in a tool agnostic capability that relies on simple inputs and requires virtually no knowledge of how the data was generated, which allows collaboration without sharing source algorithms and system properties.

NASA validated these concepts, tools and methods with simulation results from Glenn, JPL, JSC, KSC and Langley, generated in everything from Dassault's Delmia to Google Sketchup to Microsoft Excel. Validation and testing continues with the NASA Simulation Exploration Experience (SEE). SEE is University level (Graduate and Under Graduate) STEM workforce initiative integrating simulations from international university team products into a common simulation and visualization environment. DON is the primary

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Office of the Chief Information Officer (OCIO)

Lead Center / Facility:

Kennedy Space Center (KSC)

Responsible Program:

OCIO Program

display tool for this effort.

Research areas for further enhancement include: use of data from other types of simulators (ex. Computational Fluid Dynamics, Discrete Event Simulation, Distributed Simulation), local storage vs. centralized storage, system latency and other network-induced challenges, and human-computer interaction. The initial implementation of this capability is the Distributed Observer Network (DON) version 3.1. DON 3.1 is available for public release in the NASA Software Store (https://software.nasa.gov/software/KSC-13775). Contact the Program Executive for additional information on DON, SEE or the MPC communication interface.

Anticipated Benefits

Achieving NASA's next era of exploration missions has an unprecedented dependence on successful collaboration between our Centers, commercial entities, academia, international partners and future generations. Enabling these teams to integrate and view their collective work promotes cooperation, fosters a deeper understanding of mission and programmatic goals, allows for issue identification and resolution at all phases of mission and system lifecycles and, as a result, increases the likelihood of multi-decadal mission success.

NASA's long term exploration goals will span generations of scientists, engineers, technicians, managers, and astronauts. A well architected distributed visualization capability will span these generations and enable the executors of tomorrow's missions to see and understand the intent of missions and systems developed by today's designers.

Project Management

Program Manager:

Tracy A Bierman

Project Managers:

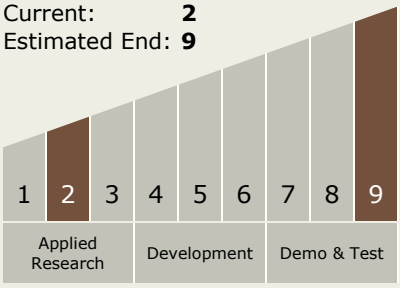
Rebecca A Mazzone
Tracey E Kickbusch

Principal Investigators:

Rebecca A Mazzone
Michael P Conroy

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **9**



Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.3 Simulation
    - TX11.3.1 Distributed Simulation

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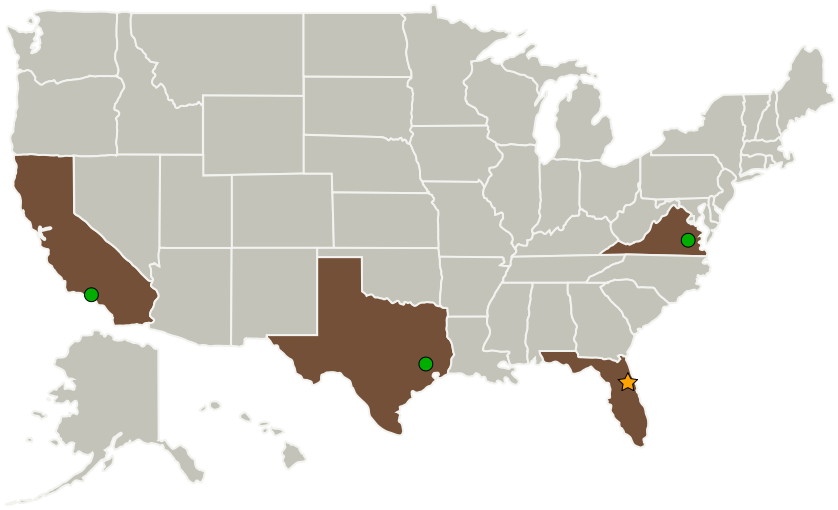
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Kennedy Space Center(KSC)	Lead Organization	NASA Center	Kennedy Space Center, Florida
●Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California
●Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
●Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
California	Florida
Texas	Virginia

Links

Article in NASA IT Talk, Page 4
(http://www.nasa.gov/sites/default/files/files/IT_Talk_Apr2014.pdf)

Technology Article in Kennedy Space Port Magazine, Page 14
(http://www.nasa.gov/sites/default/files/atoms/files/ksc_spm_dec2014.pdf)